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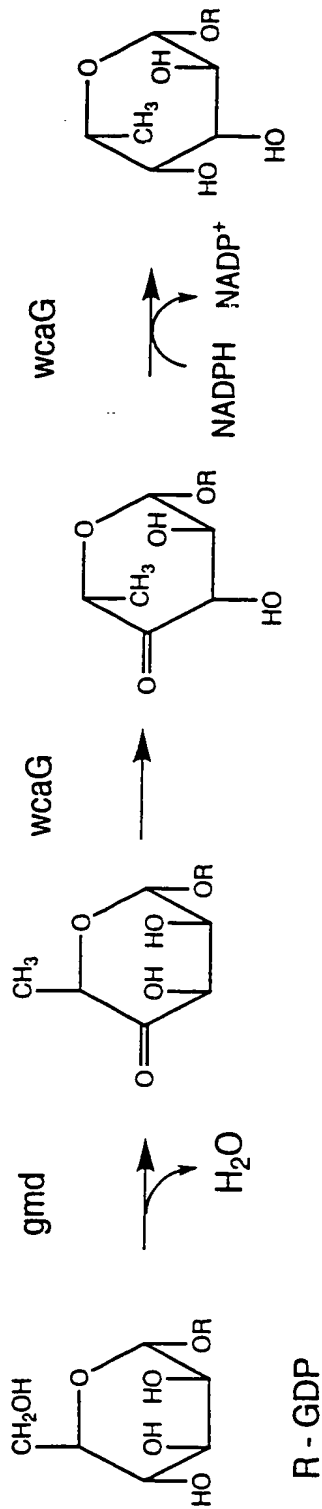
1. The first part of the paper is devoted to the study of the properties of the function  $f(x)$  defined by the equation  $f(x) = \int_0^x f(t) dt$ . It is shown that  $f(x)$  is a continuous function and that it satisfies the functional equation  $f(x+y) = f(x) + f(y)$ . The function  $f(x)$  is also shown to be differentiable and its derivative is found to be  $f'(x) = f(x)$ . This implies that  $f(x) = Ce^x$  for some constant  $C$ . The value of  $C$  is determined by the initial condition  $f(0) = 1$ , which gives  $C = 1$ . Therefore, the function  $f(x)$  is  $f(x) = e^x$ .

**GDP-4-keto, 6-deoxy-(D)-mannose**

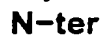
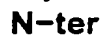
**GDP-4-keto, 6-deoxy-(L)-glucose**

GDP- (D)-mannose

**GDP-(L)-fucose**



## R - GDP

[illegible]





Year	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100
1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	

Figure 4

gale	1	-MRVLVTSGYIGSHTCVQLLONG-EDVILLDNLC	KRSVLPVIERLGGKHPTFVEGD
coli_GFS	3	KQRVFIAGHRGMVGSARROLEQRGDVHVRTR	-----DELN
human_GFS	8	-MRILVTGGSGLVGRALQKVUADGAGLFGEDWVF	-----VSSKQAD
consensus	1	.....	....
gale	59	TRNEALMTETLHDHAIETVIRFAGLKA-VGESVQKPLEVYDNNVNGTLRLISAMRAANVK	
coli_GFS	41	LDLSRAVHDEFASERIDQVYLAARKVGGIVANNTPADELYQNMIESNITHAAHQNDVN	
human_GFS	48	LDLTAQTRALPEKVQPTVHHLAAEVGGIFRNIRKYNLDEWRKNVHMNDNVLHSAFEVGAR	
consensus	61	.....	...
gale	118	NFIFSSSATVYCDNPKIBYVES-FPTGTEQ---SPYGKSRMLVEQILTDLQKAPDWSIA	
coli_GFS	101	KLLFLGSSCIYPKLAKQPMASELLQGTLEPTTFEYAIARIAGIKLCESYNROY-GRDVR	
human_GFS	108	KVVSCLSTCIPDKTTPIDETMLHNGPPHNSMFGYSYAKRMIDVQNRATFOQY-GCTET	
consensus	121	.....	....
gale	174	LTRYFNFPVGAHPSGDMGEDPQGIPNNLMHYLAQVAVGR---RDSLAIIFGNDYPTEDGTC	
coli_GFS	160	SMPTNLYGPH-----DNFHPSSNSVIPALLRRFHEATAQNAPDVVVWGS-----CTE	
human_GFS	167	AVIPTNVFGEHONF-----NIEDGHVLEGLERKVLAKS-SGSALTVMCTG-----NP	
consensus	181	.....	.....
gale	230	VRDYIHVEDLADGHVVAMEKLANK-----EGVHYINLGAGVGMVSLDQVNAFSKACGKP	
coli_GFS	208	MREPLHVDDMAAASIEHVMELAHEVWLENTQEMLSHINVGTGVVCTIRELACTIARVVGK	
human_GFS	214	RHQPIYSLLDLAQLFIWVLRREYNE-----VEPIILSVGEEDVSIKEAAEAIVEAMDEE	
consensus	241	.....	.....
gale	284	VNYEFAPRRREGDLPAYWADAASKADRETNMRVTRTLDEMAQDTMHWQSRHPQGYPD	
coli_GFS	268	GRVVPDASKPDGTPRKLLDVTRLHQ-LGWYHEISTEAGLASTYQWFLNQDRF	
human_GFS	267	GEVTFDTTKSDGQPKKTSNSKLRITYLPDERFTPFKQAVKETCAWFTDNYEQARK	
consensus	301	.....	.....

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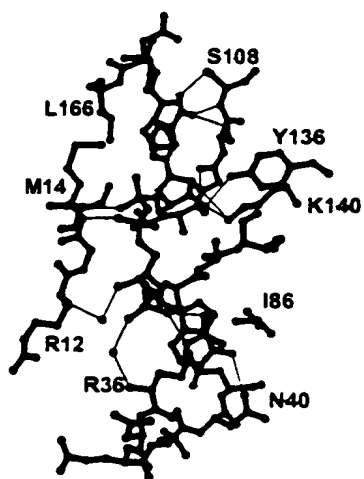
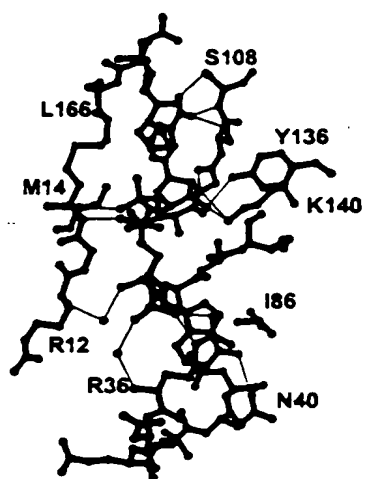
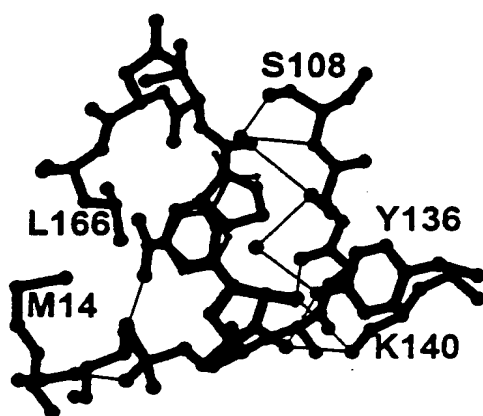
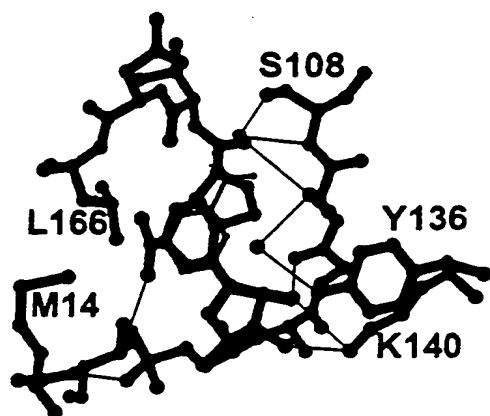
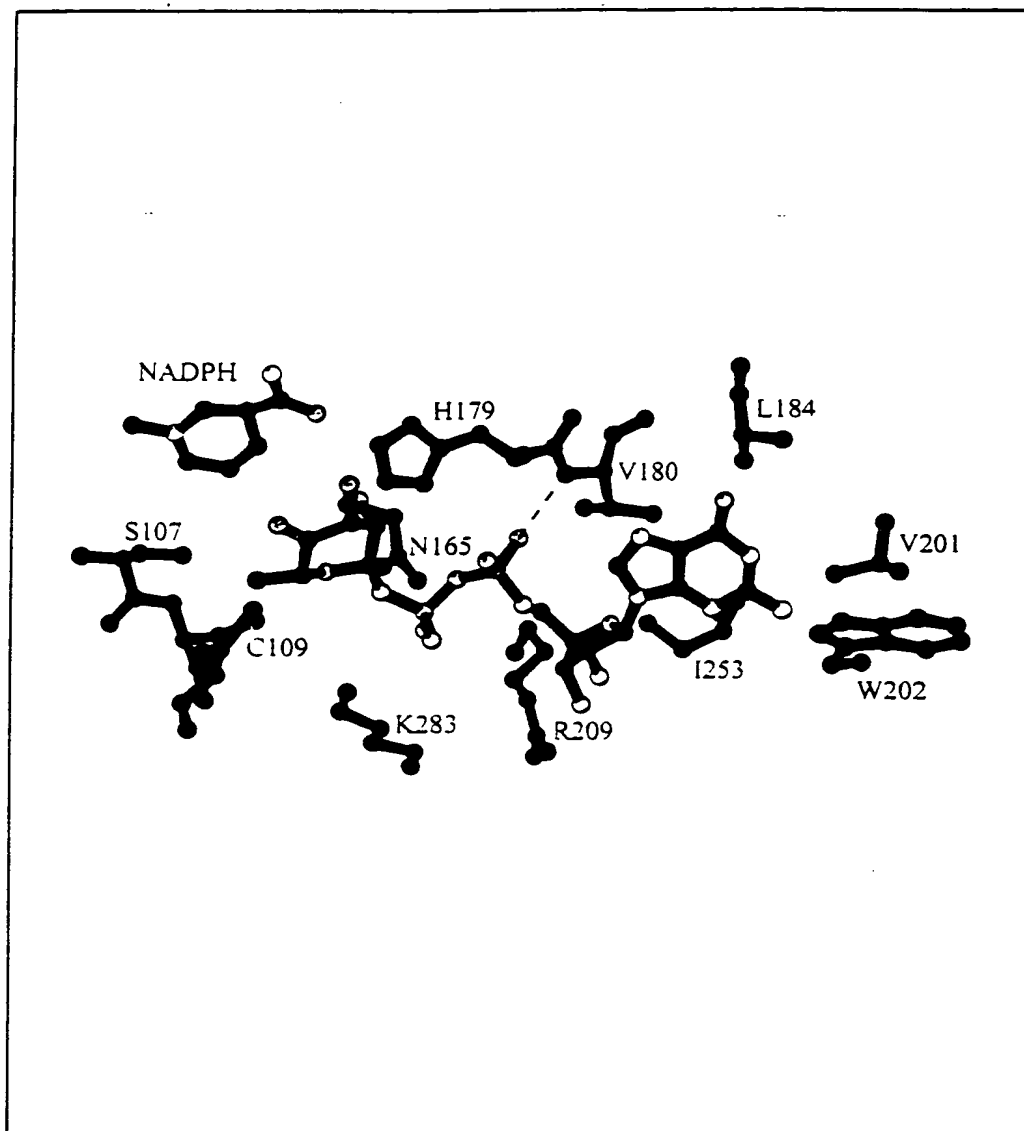


Fig 5 B



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Fig 6





**Reduction**

ribose

+

NH<sub>2</sub>

O

Tyr 136

Ser 107

ribose

NH<sub>2</sub>

O

H<sub>S</sub>

H<sub>R</sub>

Tyr 136

Ser 107

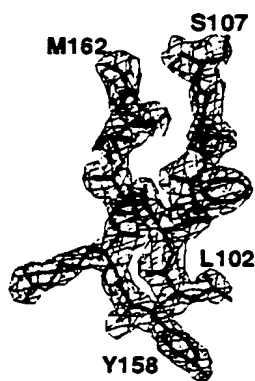
Chemical structures illustrating the active site of the enzyme, showing the interaction between the substrate (a sugar derivative) and the enzyme residues Tyr 136 and Ser 107. The structures are shown in two states: a reactant state (left) and a product state (right), separated by an equilibrium arrow.

**Reactant State (Left):** The sugar is in a chair conformation. The C1 position is substituted with an OR group. The C2 position is substituted with a CH<sub>3</sub> group. The sugar is linked to Tyr 136 via an ester bond. Ser 107 is shown with a hydrogen bond (dashed line) to the sugar's C4 hydroxyl group.

**Product State (Right):** The sugar is in a chair conformation. The C1 position is substituted with an OR group. The C2 position is substituted with a CH<sub>3</sub> group. The sugar is linked to Tyr 136 via an ester bond. Ser 107 is shown with a hydrogen bond (dashed line) to the sugar's C4 hydroxyl group.

R = GDP

$\frac{d}{dt} \left( \frac{\partial L}{\partial \dot{x}} \right) = \frac{\partial L}{\partial x}$



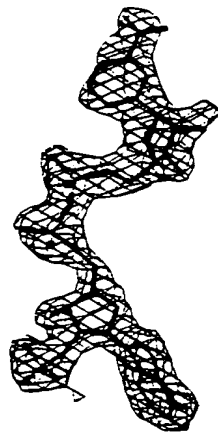
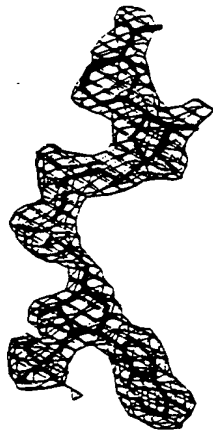
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Scale 1:4

1.26

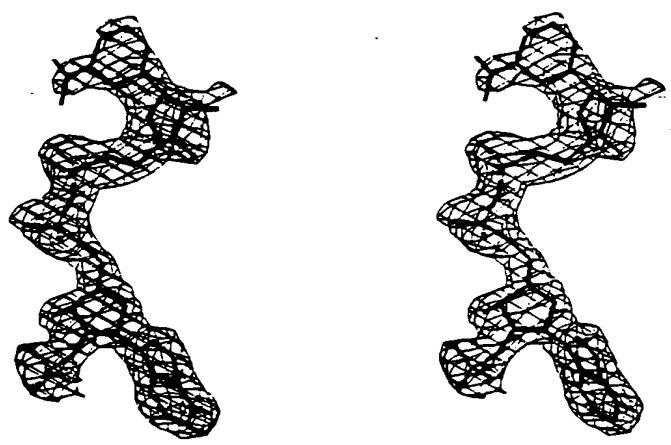
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Fig 8 C.



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